

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently Amended): A microfluidic system for liquid chromatography, the system comprising:

a substrate;

an electrochemical pump system on the substrate, the electrochemical pump system comprising a plurality of electrolysis pumps and having at least one outlet; each of the electrolysis pumps comprising:

a chamber;

a plurality of electrodes, the electrodes being coupled to an electrical source;

a fluid inside the chamber, and wherein the fluid is in contact with the electrodes,  
and wherein the fluid comprises a gas phase and a liquid phase, wherein the fluid is adapted to a  
generate a gaseous species to increase a pressure within the chamber when the electrodes are  
biased using the electrical source; and

an inlet and an outlet;

a separation column on the substrate having an inlet and an outlet, a micro channel, a solid stationary phase material packed inside the micro channel, the inlet of the separation column being coupled to the at least one outlet of the electrochemical pump system;  
and

wherein the electrochemical pump system and the separation column are configured such that the electrochemical pump system provides an elution for a separation process inside the separation column.

2. (Original): The system of claim 1 wherein the plurality of electrolysis pumps are configured in parallel.

3. (Original): The system of claim 1 wherein the plurality of electrolysis pumps are configured in serial.

4. (Original): The system of claim 1 wherein the plurality of electrolysis pumps are configured in parallel and serial.
5. (Cancelled).
6. (Original): The system of claim 1 wherein the elution provided by the electrochemical pump system is gradient elution.
7. (Cancelled).
8. (Previously Presented): The system of claim 1, further comprising:
  - a sample source, the sample source comprising a sample;
  - a sample injector on the substrate coupled between the electrochemical pump system and the separation column, the sample injector being coupled to the sample source; andwherein the separation column is configured to perform a separation of one or more components of the sample dispensed from the sample injector and the electrochemical pump system provides the elution for the separation column.
9. (Original): The system of claim 1 wherein the electrical source is selected from a group consisting of a voltage source, a current source, and a voltage/current source.
10. (Previously Presented): The system of claim 1, wherein the electrolysis pump is adapted to maintain a pressure within the chamber while the electrodes are biased using the electrical source.
11. (Original): The system of claim 10 wherein the pressure is greater than 1000 psia.
12. (Original): The system of claim 10 wherein the pressure is less than 1000 psia.
13. (Original): The system of claim 10 wherein the pressure is less than 100 psia.
- 14-16. (Cancelled).
17. (Previously Presented): The system of claim 1 wherein the electrochemical pump system provides a flow rate of about 1 nanoliter per minute to about 1 micro liter per minute through the separation column.
18. (Previously Presented): The system of claim 1 wherein the electrochemical pump system provides a flow rate of less than about 1 nanoliter per minute through the separation column.

19. (Previously Presented): The system of claim 1 wherein the electrochemical pump system provides a flow rate of greater than about 1 micro liter per minute through the separation column.
- 20-21. (Cancelled).
22. (Previously Presented): The system of claim 1, wherein the plurality of electrodes comprise at least one material selected from the group consisting of carbon, platinum, gold, aluminum, titanium, and chromium.
23. (Currently Amended): The system of claim 1, wherein the multi-phase fluid comprises an electrolyte.
24. (Currently Amended): The system of claim 23, wherein the multi-phase fluid comprises an organic liquid selected from a group consisting of acetonitrile, methanol, ethanol, tetrahydrofuran, isopropanol, and toluene.
25. (Original): The system of claim 1 wherein the electrolysis pump further comprising a plurality of chambers configured in series and containing same or different fluid inside each chamber.
26. (Previously Presented): The system of claim 1, further comprising a mixer on the substrate coupled between the electrochemical pump system and the separation column, the mixer is configured such that different components of the elution provided by the electrochemical pump system are mixed with each other before entering the separation column.
- 27-29. (Cancelled).
30. (Original): The system of claim 1 further comprising a detection device coupled to separation column through the outlet of the separation column.
31. (Previously Presented): The system of claim 30, wherein the detection device being disposed on the substrate with the separation column.
32. (Previously Presented): The system of claim 30, wherein the detection device is selected from the group consisting of a UV analyzer, a conductivity analyzer, a refractive index analyzer, a fluorescence analyzer, an electrochemical analyzer, a light scattering analyzer, and a mass spectrometer.

33. (Previously Presented): The system of claim 1, wherein the electrochemical pump system and the separation column are constructed from at least one technique selected from the group consisting of multi-chip packaging, injection molding, photolithography, dry etching, wet etching, evaporation, sputtering, and chemical vapor deposition.

34-86. (Cancelled).